DOCUMENT RESUME

ED 185 642 EA 012 565

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TITLE Some Theoretical Considerations Influencing Educational Finance in the 1980's.
PUB DATE 25 Sep 79
NOTE 20p.; Paper presented at the Annual Meeting of the Canadian Association of School Administrators (September 25, 1979).

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Costs; *Declining Enrollment; Elementary Secondary Education; *Expenditure Per Student; *Financial Problems; *Financial Support; Grants; Inflation (Economics); Program Costs; *Resource Allocation; Retrenchment; School Funds; *School Support; State Aid; Unit Costs
IDENTIFIERS Canada

ABSTRACT

The major problem to be faced in Canada in the next decade is resource allocation. Administrators must make conscious efforts to distinguish between changes in price levels that are the effect of inflationary pressures and increases in costs that are the result of changes in quality or quantity of inputs. A second area extremely important in dealing with declining resources will be the way available resources are distributed. Critical will be an understanding of the difference between average and marginal cost. Average cost measures include cost per student, cost per teacher, and cost per classroom. Marginal cost may be defined at the actual saving or cost that results from adding or subtracting one more unit to the system. When resources are allocated according to a formula based on average cost (such as amount per student) during a period of declining enrollment, fund allocation goes down more than actual marginal savings go up. Although the number of students has declined, the total cost for teacher salaries or plant maintenance remains the same. School boards must be helped to adjust to this situation through a reorganization of allocation systems to reflect true costs more accurately. (Author/JM)

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SOME THEORETICAL CONSIDERATIONS INFLUENCING EDUCATIONAL FINANCE IN THE 1980's

Paper Presented to

Canadian Association of School Administrators
Tuesday, September 25, 1979

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SOME THEORETICAL CONSIDERATIONS INFLUENCING EDUCATIONAL FINANCE IN THE 1980's

There are three fundamental questions which must be dealt with in any discussions of educational finance. They are:-

1) How much money is to be spent on education?

2) How is the money to be raised?

3) How are the monies to be distributed?

I shall limit myself to commenting upon the first and third question. I propose to examine the first question in the light of what promises to be the two most important factors affecting the question of total expenditure: the problem of declining enrolments and inflation. I will look at the question of distribution by making a critical comment on the approach taken in the design of grant structures and allocation systems in Canada.

I have omitted discussion of revenue deliberately. Inevitably any question of revenue raising would tend to focus around the property tax and its role in educational finance. Such a focus might well be misleading. For instance, as we are all aware the Canadian constitution provides that Provincial Governments have exclusive power to legislate in the field of education. As a result, the decision as to whether the Provincial Government administers a system of education through locally elected boards with access to the property tax base is political in the context of overall Provincial Government policy. As a consequence there are considerable differences in the role of the property tax in educational finance across Canada.

The problems to which I wish to address myself are those which are of concern in all Provinces whether or not they have a partnership arrangement for the raising of revenues. First of these more general questions is related to the amount of money which will be available to finance education.

In the 1950's and 1960's there was a major shift in the burden of financing education from the Municipal to the Provincial levels of Government. Educational finance is therefore now profoundly affected by the conditions which will govern the financing for all public services in the 1980's. It is clear that increasing constraints being placed on the financing of the Provincial Public sectors as a whole. I would remind you of the so-called Edmonston commitment of 1973 where the Finance Ministers of the Provinces agreed to limit increases in transfers of funds to Municipal Governments and social agencies to the same rate of growth as Provincial revenues. Although the rate of growth of fiscal transfers in the majority of cases have increases beyond those of Provincial revenues, the intention of applying a brake to the growth of the Provincial Public sector has been made clear. Furthermore the impact of these forces is already clear. Statistics Canada, for instance, reports that between 1972 and 1976 expenditures on education as a percentage of personal income declined in all Provinces of Canada except British Columbia where it rose marginally from 7.9 percent to 8.2 percent. It is suggested that the outlook for educational finance in all Provinces of Canada will not be

dissimilar to that in Ontario. This outlook was summed up in the introduccion to the final report of the Commission on Declining Enrolments:-

> the main challenges facing the people who make decisions for our education systems do not come from declining enrolments, but from the economic and public finance conditions that characterize the late 1970's and promise to be facts of life for some years to come. These conditions make it difficult to accommodate decreasing enrolments, but they are also conditions that would have made it far more difficult to accommodate to increasing enrolments.

It would appear therefore that the major problems to be faced in the next decade of educational finance are those concerned with adjustment to the new lower levels of resource allocation. Adjustment to a lower standard of living is not an easy process. If adjustment is forced rapidly, the results may well be catastrophic insofar as programs are concerned. If they are to be managed properly there are two areas to which we must pay particular attention.

The first area of attention is the adjustment for inflation. There are three determinants of the total cost of education.

a) The number of students in the system.

b) The quantity of inputs made available to each student in the system.

c) The price levels of each of the inputs.

There is wide spread public belief that only the first of these factors is significant and that the total resources to education should be allocated directly in proportion to the number

of students in the system. It is perfectly obvious, however, that each of the three factors can and do vary independently. For instance, present approaches to programing in most Provinces provide for additional emphasis in the areas of special education, vocational and technical education and multicultural education. All three programmatic approaches require higher than average quantities of inputs per student involved. Increases in total cost resulting from programmatic decisions may be influenced by policy makers. Increase in cost resulting from price level increases are less controllable.

In view of the fact that the next decade promises to be associated with continuing high levels of inflation, there is little evidence to suggest that we will see any reduction in general price levels. A rise in the general level of prices is, in fact, one of the broader definitions of inflation. There are two considerations associated with this definition of inflation which have important administrative consequences. The first consideration is that an increase in price due to inflation must be separated from an increase in price as a consequence of an improvement in quality. An increase in the price of an automobile may reflect increases in the price of raw materials, energy and labour but it may also reflect improvements in technology such as more efficient but more expensive pollution control devices and safety features. Part of the increase in price is due to inflation, part is due to quality improvement.

Clearly in the process of adjusting to lower levels of financial resources, school administrators must endeavour to keep pace with inflation. The difficulty in education is to distinguish between increases in cost which result from inflation and those which are a consequence of policy decisions which presumably relate to quality. Thus increases in cost which are a result of improved qualifications or additional experience on the part of teachers or other personnel in the educational enterprise cannot and should not be attributed to inflation. Increases in cost which result from reductions in pupil-teacher ratios associated with the introduction of program of special education, multiculturalism or technical education similarly cannot be attributed to inflation. Administrators must make conscious efforts to distinguish between changes in price level which are the effect of inflationary pressures and increases in cost which are the result of changes in quality or quantity of inputs made available. To a large extent, school administrators can exercise no control over price levels which are determined outside the educational sector. Administrators do, however, have power to exercise some control over increasing costs which are the result of assumptions about quality of inputs. For instance, if one assumes that experience is a quality determining characteristics of labour services provided in education, then it is possible only to count that proportion of a salary increase which reflects adjustment to inflationary pressure in the economy as a whole. Increments which result from increased experience

are quality factors and cannot be treated as a result of inflationary factors.

Unfortunately the problem of dealing with inflation in education is made more difficult by the lack of an accepted measure of inflation. We are all aware of the significance which the consumer price index exerts in salary negotiations and public discussion of inflation. To relate the consumer price index, frequently miscalled the cost-of-living index, to an educational budget is a mistake. Most of the change reflected in the Canadian consumer price index is determined by the changes in the price of food, clothing and accommodation based on expenditure patterns of medium size family groups at medium income levels in urban centres in Canada. The consumer price index may have relevance for the adjustment of salaries of those employed in the educational system, but the consumer price index is not adequate to reflect the changing price levels of other materials and services purchased in the educational budget such as transportation or the cost of plant operation and maintenance. Given the significance of these items in the educational budget and the probability that their price levels will increase very dramatically over the course of the next decade, it is quite likely that adjustments to school budgets which reflect only the element of inflation measured by the consumer price index will be less than adequate to offset the changing price levels of educational inputs. The probability of continuing inflation makes it highly advisable that attempts be made to examine the

impact of inflation on school budgets. It is quite certain that the method that is used to accommodate for inflation will be extremely important in adjusting to the reality of declining resources.

A second consideration which will be extremely important in assisting school administrators to adjust will be the way in which the available resources are distributed either through grant structures in those Provinces where a financial partnership exists or through the formula system in Provinces with centralized funding. Critical in designing these structures will be an understanding of the differences between average and marginal cost. We are all familiar with the concept of average cost. It is, after all, only the total cost divided by some measure of utilization. We may compute the average cost per student of elementary and secondary education, the average cost per teacher or the average cost per classroom. Measures of average cost are useful for comparative or illustrative purposes. Unfortunately measures of average cost tend to conceal more than they demonstrate in a changing situation.

The concept of marginal cost on the other hand is particularly useful in examining changing situations. The marginal cost may be defined as extra saving or cost that results from adding or subtracting one more unit to the system. Generally speaking, systems of resource allocation used in Canada are based on the concept of average cost. I hope to be able to demonstrate that whilst the use of the average cost per student is a device which

favours school administrators at a time of increasing enrolments, it is a measure which makes downward adjustment extremely difficult.

In order to demonstrate this argument I will make use of a hypothetical example based on realistic assumptions. Although we use a wide variety of measures to describe an educational system statistically, the basic education unit for practical purposes is the classroom with one teacher and a number of students. Wtihin a given range, let us say between 25 and 30 pupils per classroom, certain costs are fixed and certain costs are variable. Figure 1 provides a hypothetical example of the total cost of operating such a classroom. The total salary cost for this classroom is fixed for any number of students between 25 and 30. Similarly, plant operation and maintenance costs also tend to be fixed. We will assume for simplicity's sake that all other aspects of cost vary directly in proportion to the number of students in the class.

In figure 2 the total cost of the classroom at different levels of enrolment is shown and a breakdown between average costs per student and marginal cost per student is provided. The average cost per student is derived by dividing the total costs as shown in figure 1 by the various class sizes. The marginal cost, however, is the difference in total cost which is the result of adding one student at a time. It will be noted from figure 2 that whilst the average cost per student declines as enrolment in the class

FIGURE I

Operating Cost Breakdown of Classroom with Enrolments between 25 - 30 Students

Number of Students	COSTS			
	Salary	Plant Operation & Maintenance	Auxiliary, Administrative & Instructional Supplies	Total
25	20,000	7,692	6,153	30,769
26	20,000	7,692	6,398	31,016
27	20,000	7,692	6,643	31,263
28	20,000	7,692	6,888	31,510
29	20,000	7,692	7,133	31,757
30	20,000	7,692	7,378	32,004

Assumptions

1) Salary and Plant Operation and Maintenance costs are fixed over enrolment range.

2) Auxiliary and Administrative costs are directly variable with enrolment.

3) Instructional Supplies costs are directly variable with enrolment.

4) Cost Distribution at 25 enrolment:- 65% Salary
25% Plant Operation and Maintenance
10% Auxiliary, Administrative & Instructional Supplies

FIGURE II

Average and Marginal Cost for Enrolments between 25 - 30 Students

Class Size	Total Cost (Figure 1)	Average Cost Total Cost Class Size	Marginal Cost Total Cost 26- Total Cost 25-	Total Grant
25	30,769	1,230	247	30,769
26	31,016	1,193	247	31,980
27	31,263	1,158	247	33,210
28	31,510	1,125	247	34,440
29	31,757	1,095	247	35,670
30	32,004	1,066	247	36,900

increases, the marginal cost remains constant. In the real world, the effect on a school board budget of an increasing enrolment is the marginal cost increase resulting from additional enrolments. The grant structures used in Canadian school systems, however, do not utilize the concept of marginal cost. School grant systems whether they use a basic grant per student, a grant per classroom unit, or a grant per recognized teacher treat each student as being the same value. If we assume that the grant structure is such as to provide a flat grant of $1,230.00 per student, we note that the grant would provide for the total cost of operating the class at the enrolment of 25. For every additional student who was placed in this class, the board would receive a grant of $1,230.00 which is in excess of its actual cost. Any school board which could increase the number of students per classroom would reap the benefit of this feature of the grant structure and would probably apply that benefit to increasing the amount of service rendered in the classroom or hold the tax rate constant. The difference between the marginal cost and the marginal revenue is of substantial benefit to school board administrators during the period of the increase in enrolment.

During the period of decline in enrolments, the difficulties of the unit grant and the significance of marginal costs become more apparent. Figure 3 utilizes the data generated in figures 1 and 2 and shows what happens when our classroom is reduced through the declining enrolment phenomena from 30 to 25 students.

FIGURE III

Effects of a Decline in Enrolment from 30 - 25 Students

Class Size	Total Cost (Figure I)	Average Cost (Figure II)	Marginal Saving (Figure II)	Revenue	Loss
30	$32,004	$1,066		30 x 1,230 $36,900	
25	$30,769	$1,230	$1,235	25 x 1,230 $30,769	$6,131

The total cost of operating the classroom after the decline in enrolment will be reduced. It will not be reduced directly proportionally, however, because as we have noted certain components of total cost do not vary directly with enrolment. Using the figures developed in figure 2, we notice that the marginal saving, that is to say the actual saving to administration as a consequence of the reduction of 5 students is $1,235.00. The total cost in revenue to the board, a direct consequence of the use of the flat grant approach is found by multiplying the number of students by the value of the grant, in this case is $6,131.00. The difference between the loss in grant and the marginal or actual saving to the board must be made up by one of two ways. The board must reduce overall service to the extent of this difference or, if a partnership financing arrangement exists, the board may access the local property tax for the difference.

The above discussion is based on a hypothetical example. In order the perserve the simplicity of the illustration I have assumed that the changes in enrolment take place within one year and that for that year both prices and grant levels remains stable. In practice the picture is complicated by changes in price levels and grant levels. Furthermore administrative reorganizing tends to obscure the effect even more. Thus if we were to use three classrooms in our hypothetical example and assume that decline in enrolment was the same in each of the classrooms, a reduction in total cost from 90 students to 75 might permit the closure of

one classroom, thus altering significantly the total and marginal cost data. The opportunities for restructuring are greater in larger school organizations and it is thus likely that smaller school systems will feel fiscal pressures first. It is clear, nevertheless, that a time will come in the declining enrolment picture when the opportunities for consolidation and combination have been utilized. At this point severe educational problems may be anticipated.

Let me attempt at this point to summarize the marginal cost problem. In a declining enrolment situation, the actual saving to the board or administration which results from the reduction in the number of pupils is likely to be less than the reduction in grants or allocations received from the Provincial Government if they are paid on a flat grant or unit basis. This implies that the savings occasioned as a result of declining enrolments are not automatically shared by local administrators and the Provincial Government equally. One direct consequence will be a reduction in levels of service at the local level or increase in local taxation.

There are three ways of assisting school boards to adjust to the problem. All three matters require reorganization of grant or allocation systems.

The first and most radical of the three approaches is to eliminate the per student method of funding altogether and to adopt a system of programmatic funding in which minimum core programs might be identified and financed wholly from Provincial

resources. An essential element of such an approach would be to divorce the provision of such minimum educational programs from direct enrolment considerations. Time does not permit a complete examination of this approach, although it should be noted that such an approach is a necessary feature of the administration of schools in Northern Canada and overseas operated by both Provincial and Federal Governments.

The second and probably the most simple way of helping boards to bring marginal costs saving and revenues into line is the use of averaging techniques. A variety of approaches are available. Perhaps the simplist one is the technique known as slip year financing. In this approach allocations are based on enrolments but the affect of declining enrolments is averaged out. For example, one might use current year enrolment as one-third or one-fourth in the computation of eligibility. Enrolment might be calculated as follows:

$$\text{Enrolment (for grant purposes 1978)} = \frac{\text{Enrolment in 1976}}{3} + \frac{\text{Enrolment in 1977}}{3} + \frac{\text{Enrolment in 1978}}{3}$$

A second relatively simple approach would be the use of base year financing. This involves identifying a base year for enrolment and grant purposes and adjusting annually by some percentage figure any change in enrolment from the base year. Thus if the enrolment in 1977 was identified as the base year and 50 percent as the adjustment percentage.

$$E_{1978} = E_{1977} \pm \left[.5 \left(E_{1978} - E_{1977} \right) \right]$$

A third approach less radical than the first but perhaps more effective than the second would be to depart from per pupil per classroom or per teacher allocation systems altogether and to adopt an approach which would ensure that the marginal savings at the school board level were reflected more accurately in the allocation system. This could be accomplished by the use of a system in which the grant constituted a percentage of the total expenditure of the administrative unit. Such an approach was first recommended by Harlan Updegraff in the early 1930's and utilized in the initial structure of the Ontario grant plan instituted in 1969. At that time the Ontario plan did not place limits on expenditures. For a variety of reasons a ceiling on expenditures per pupil was introduced in 1972. Subsequent modifications to ceilings have had the effect of transferring a variable percentage grant into a per pupil grant. The problems of a revenue decline greater than the marginal cost saving has become increasingly apparent.

There is clearly need for educational cost analysis to focus on the concept of marginal cost rather than average cost. Much research is to be done in this area. Unfortunately the concept of average cost is so deeply ingrained in the tradition of educational cost analysis and administrative thinking that it will require major effort to change it.

As may be noted from my initial remarks, I am not optimist about the financing of education in the decade ahead. I have

suggested that the resources available to all public services including education will be severely limited by economic forces beyond our control. In this context educators will be faced with two major problem areas: the problem of inflation and the problem associated with resource allocation systems. Problems associated with inflation in education are compounded by our inability to distinguish between cost increases which are the result of negotiated policies or legitimate desires to improve the quality of educational inputs and inflationary factors at work in the economy as a whole. The problem with our resource allocation systems is that they are based on a time in which enrolments were relatively stable and in which average cost constituted a reasonable measure of marginal cost. The recent increases and decrease in enrolments in our school systems have made the concept of average cost less useful. Until adequate research is undertaken on the marginal cost problem little change is likely. Given the existence of these problem areas we will face increasing difficulty in maintaining the basic gains in education made over the course of the last ten or fifteen years. The tragedy is that it may already be too late to change the course of events.

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September 25, 1979